

Radiopurity measurements in steel

Last update: December 21, 2001 - L. Cadonati

This is a collection of steel radiopurity measurements, performed with the Ge detectors in Gran Sasso as part of the material screening campaign for CTF. I also have three measurements of Borexino materials - except for the material in the SSS, which is the official SSS measurement by Aldo and Matthias, all the others I had collected from various notes before 1996 - they were performed by C. Arpesella.

The labels I am reporting are the ones that appear in the notes, I do not know anything more about the samples.

September 2001 update: the table now includes the measurements performed on the actual steel used in the vessel end regions.

Please follow the link for a [table of the external backgrounds](#) induced in Borexino.

Sample	²³⁸ U (²²⁶ Ra) (mBq/kg)	²³² Th (²²⁸ Th) (mBq/kg)	⁴⁰ K (mBq/kg)	⁶⁰ Co (mBq/kg)	²³⁵ U (mBq/kg)
Carbon Steel from Kunze, used for the CTF tank	< 2	3	< 9	6 in a sample 56 in a different one	
CTF Fluid Handling	< 24	< 25	< 260	23	
Stainless Steel Princeton (I have no idea what it was)	< 3	< 8	< 20	30	
Stainless Steel C.S.M.	< 2	< 2	< 11	37	
SS Open Structure	44	30	< 104	13	
Borexino platform	< 40	< 1	< 10	1	
SS bottom of the Borexino water tank	< 3	< 4	< 13	10	
SS from the sphere - AISI 304L	11 ± 1	9 ± 2	2 ± 1	96 ± 2	
AISI 316L for vessel end regions (2001)					
SS Rancocas # 1	2.0 ± 0.4	13.5 ± 0.8	< 4.2	2.0 ± 0.2	2.8 ± 0.9
SS Rancocas # 2	2.1 ± 0.4	15.3 ± 0.9	< 4.5	2.2 ± 0.3	1.7 ± 0.8
SS Rancocas # 3	1.8 ± 0.4	3.7 ± 0.6	< 4.7	15 ± 1	1.4 ± 0.8
SS Rancocas # 4 (7/8" sheet, OV mount ring)	1.7 ± 0.5	8.4 ± 0.6	< 4.1	20 ± 1	1.3 ± 0.8
SS 4" pipe (IV - OV pipe)	1.8 ± 0.8	2.8 ± 0.7	< 7.9	10 ± 1	1.8 ± 1.1
SS 8" pipe (OV - SSS pipe)	3 ± 2	< 2	< 9	11 ± 1	< 2
SS 0.5" conduits	18 ± 8	< 4.2	< 19	18 ± 5	
SS 0.75" conduits	< 12	< 30	< 38	25 ± 7	
SS 1.0" conduits	< 5	< 2.2	< 23	10 ± 4	
SS 8" pipe (IV rope attach)	< 4	< 3	< 25	11 ± 2	
SS tube 1"OD, 1/2"ID (IV+OV rope attach)	< 20	8.7 ± 1.7	< 80	16 ± 3	
SS 8" pipe (OV rope attach)	< 15	7.3 ± 1.1	< 36	17.2 ± 2.1	
SS square rod 1-1/4" (IV+OV rope attach)	< 21	< 17	< 170	29 ± 4	

Conversion to mass concentration:

²³⁸U: 1 mBq/kg = 81 ppt

²³²Th: 1 mBq/kg = 246 ppt

⁴⁰K: 1 mBq/kg = 32 ppb Knat